REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

In the specification, paragraphs [0001], [0002] and [0015] have been amended

A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After entry of the present Amendment and Reply, claims 1-20 are pending in this application.

Election

Restriction was made between Claims 1-20 (Group 1) and Claims 21-22 (Group 2). During a telephone conversation with the Examiner on 9/23/03, Paul Hunter made a provisional election with traverse to prosecute the invention of Group 1, Claims 1-20. Applicants hereby affirm this election.

Rejection Under 35 U.S.C. §102(b)

In the Office Action, Claims 1-9 and 16-20 were rejected under 35 U.S.C. 102(b) as being anticipated by Liebmann (U.S. Patent No. 6,057,063). Applicants respectfully traverse the rejection. Liebmann fails to disclose, suggest, or teach the claimed invention as recited in Claims 1-9 and 16-20, as amended.

On Page 4 of the Office Action, the Examiner states:

> Liebmann discloses a phase shift design mask system. The method
> may be used to design bright field phase shifted masks. Features 1
> on the chip that require a phase-shifted portion of the mask are
> located (critical regions) and designed by edges 2. Phase-shifted

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regions 3 on opposite sides of the features are created on the mask. Proper phase termination of the phase regions are ensured and the phase are determined for the phase-shifted regions. A residual phase edge removal design is then derived (col. 3, 56- col. 4, 3 col. 5, 51-63). Critical dimension chrome features are bordered by a 90° phase region on one side and a 270° phase region on the other side. The background of the mask is left at 0° phase (col. 6, 8-1). A light field mask includes opaque chrome features in a clear background. The phase shift design includes designing areas within the general mask background that will need to have a phase assigned to them. The edges are then projected outward (col 7, 41-46). A phase shift mask using 0° and 180° phase shift regions with either a separate trim mask or intermediate phase steps to erase residual phase edges may also be formed (col. 9, 59-64, col. 10, 1-25).

Applicants respectfully disagree with the Examiner. The Examiner has merely described how <u>Liebmann</u> forms phase shift areas on opposite sides of mask features. <u>Liebmann</u> fails to disclose the creation of "boundary regions." Claims 1-9 and 16-20 recite boundary regions around edges of phase regions that are on either side of critical regions. <u>Liebmann</u> only describes phase regions on sides of critical regions.

Claim 1 recites:

> defining critical poly regions and adjoining poly, the critical poly regions being regions desired to be defined by phase shifting;
>
> **creating phase regions on either side of the critical poly regions;**
>
> assigning phase angles to the phase regions such that the phase regions have either a first phase angle or a second phase angle;
>
> **defining edges of the phase regions** being assigned the second phase angle, the edges not defining a poly pattern;
>
> **defining a boundary region around the defined edges;**

Claims 2-9 depend from Claim 1 and, therefore, also require these same elements.

Claim 16 recites:

> **providing phase regions on sides of critical mask features;**
>
> assigning phase polarities to phase regions;
>
> **defining edges of the assigned phase regions;**
>
> **establishing a boundary around the defined edges;**

Claims 17-20 depend from Claim 16 and, therefore, also require these same elements.

Figures 3 and 4 of Liebmann shows how Liebmann "deals with edges of phase regions." (Col. 8, lines 49-50.) Liebmann does not create boundary regions, as recited by the Applicant's claims, but rather Liebmann creates "fill shapes to occupy gaps of smaller than specified widths between phase regions." (Col. 8, lines 60-61.) These fill shapes in Liebmann are given the same phase characteristics as the regions they are adjacent to, but *do not extend along the edges of the phase regions that do not define the critical area.* That is, the fill areas simply fill small gaps between phase regions. In contrast, Applicants' claims require that the added boundary regions be defined **"around the defined edges"** (claims 1-9 and 16-20).

Anticipation of a claim by a prior art reference requires that the reference disclose each and every limitation in the claim. Liebmann does not teach the boundary regions recited by Applicant's claims. Accordingly, the rejection under 35 U.S.C. §102(b) of claims 1-9 and 16-20 based on Liebmann cannot be properly maintained. Applicants respectfully request the withdrawal of the rejection.

Rejection Under 35 USC §102(e)

In the Office Action, Claims 1-20 were rejected under 35 U.S.C. 102(e) as being anticipated by Ludwig (U.S. Patent No. 6,543,045). Applicants respectfully traverse the rejection. Ludwig fails to disclose, suggest, or teach the claimed invention as recited in claims 1-20, as amended. Applicants hereby reserve the right to swear behind Ludwig.

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On pages 4 and 5 of the Office Action, the Examiner states:

> Ludwig discloses forming a phase shift mask. Critical regions are defined as having a distance between them less than a predefined minimum value. Individual sections of the polygons are assigned phases which have a phase difference of 180°. Figure 8 illustrates a bright-field mask 200 with non-transparent regions 21. Phase shifting elements 22 (hatched polygons) are determined on each side of non-transparent or critical regions 21. When straight sections of the non-transparent regions 21 end within a phase shifting element 22, an end region 23a is generated. End region 23b is generated at the point where a critical region 21 ends at a critical interaction region. Degenerated critical regions are then defined by removing overlapping regions 23 from non-transparent regions 21. The coherent regions that lie outside the phase-shifting regions and the critical regions are determined along with the outer borders of the coherent regions the overlapping regions and the end regions. The number of contact lines between the specific outer borders and the degenerated critical regions is determined and the phase conflict is determined if the number is uneven. The phase conflict is resolved by defining the region borders (boundary) and obtaining a set of connecting paths between pairs of parallel edges opposite one another of respective polygons. The set of connecting paths is reduced and coverage regions are formed as region boundaries between two different regions of the phase mask to be manufactured such that the coverage regions have phase shifts with a phase difference of 180° degrees. A trim mask may be used for exposing the coverage regions. See col. 4, 18-65, col. 10, 43 – col. 12, 11, col. 15, 8 - col. 16, 34.

Applicants respectfully disagree with the Examiner. The Examiner is describing how Ludwig resolves phase conflicts that result from straight sections of non-transparent regions 21 (Fig. 8) ending within a phase-shifting element 22. **This phase resolution technique described in Ludwig is the same gap fill procedure described in Liebmann**. Simply described, this gap fill procedure involves the creation of a phase shift area in locations where a phase shifting area is too close to another phase shifting area. Ludwig describes this gap filler as "end region 23a" and can be seen in Figs. 10A-C where phase shifting elements 22 are too close to each other.

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In contrast, as discussed above with respect to the rejection based on <u>Liebmann</u>, Applicants' claims require that the added boundary regions be defined **"<u>around</u> the defined edges"** (claims 1-9 and 16-20), not just in certain locations where multiple phase shift areas are too close to each other. Claims 10-15 also require construction of a boundary region. In addition to the construction of a boundary region, Claims 10-15 include a procedure like the gap fill procedures of <u>Ludwig</u> and <u>Liebmann</u> where "break regions" are defined where phase transitions are likely to occur. As such, Claims 10-15 further illustrate that <u>Ludwig</u> and <u>Liebmann</u> do not anticipate Applicants' claimed invention.

Anticipation of a claim by a prior art reference requires that the reference disclose each and every limitation in the claim. <u>Ludwig</u> does not teach the boundary region recited by Applicant's claims. Accordingly, the rejection under 35 U.S.C. §102(e) of claims 1-20 based on <u>Ludwig</u> cannot be properly maintained. Applicants respectfully request the withdrawal of the rejection.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1447. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1447. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 06-1447.

Respectfully submitted,
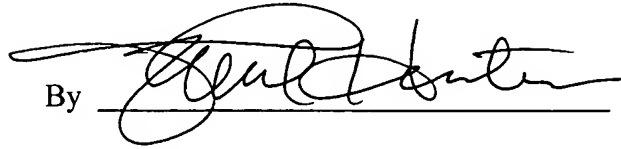
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